Shipping ECAs to cut air pollution

Christer Ågren
AirClim
50,000 deaths/year in Europe

In Europe, emissions from international shipping is responsible for some 50,000 premature deaths per year due to PM$_{2.5}$

Ship emissions also contribute to damage to nature and biodiversity, and to damage to materials, incl. our cultural heritage.

Sources: J. Brandt et al, CEEH, Denmark (2011); EEA (2017)
Ship emissions occur close to land

Gridded emissions 2015: At left SO$_2$ and at right NOx (thousand tons/grid)

Globally, 70-80% of ship emissions take place within 400 km from shore

Sources: IIASA (2018), ICCT (2007)
EU28 land-based vs. shipping around Europe 1990-2015 (kton)

SO₂

Land-based SO₂ cut by 89% 1990-2015

NOx

Land-based NOx cut by 56% 1990-2015
Prescription for an effective ECA

- **Sulphur standard**: 10 ppm (currently 1000 ppm)
- **NOx standard new ships**: 1-2 g/kWh (current Tier III: 2-3.4 g/kWh)
- **NOx control existing ships**: Either phase-in of standard (as above) or use of economic instruments
- **PM standard (new & existing ships)**: To be derived from DPF performance
- **Reduced speed**
- **Continuous emissions monitoring**
- **Enforcement**
- **Decarbonisation**
Cover all European seas regions

Sea regions:
- Arctic (ARCT)
- Atlantic Ocean (ATLO)
- Baltic Sea (BALS)
- North Sea with English Channel (NORS)
- Celtic Sea CELS)
- Bay of Biscay (BBIS)
- Mediterranean Sea (MEDS)
- Black Sea (BLAS)

Source: IIASA (March 2018)
AirClim study on NECA + Levy & Fund for the Baltic Sea and the North Sea

Sources: IVL/CE Delft (2016); IVL (2017)
CBA for NECA + Levy & Fund

NECA + Levy & Fund: Benefits as VSL vs. costs (central valuation)

<table>
<thead>
<tr>
<th>Year</th>
<th>Benefits (VOLY)</th>
<th>Costs (VSL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2025</td>
<td>1490</td>
<td>5061</td>
</tr>
<tr>
<td>2030</td>
<td>1452</td>
<td>5146</td>
</tr>
<tr>
<td>2035</td>
<td>1423</td>
<td>5320</td>
</tr>
<tr>
<td>2040</td>
<td>1395</td>
<td>5494</td>
</tr>
</tbody>
</table>

Source: IVL (2017)
More information?

Subscribe to Acid News!

www.airclim.org
Sulphur content of transport fuels

- **Global average**: 2.5%
- **IMO global marine fuel limit from 2012**: 35000 ppm
- **Marine fuel oil current global average**: 25000 ppm
- **IMO global marine fuel limit from 2020**: 5000 ppm
- **IMO SECA fuel limit from 2015**: 1000 ppm
- **Road transport and inland shipping fuel limit**: 0.001%
IMO NOx-standards for new ship engines

Compare to EU-standards (Euro VI) for new heavy duty diesel engines in trucks and buses set at 0.4 g/kWh as from 2013 - down from 8 g/kWh from 1992 (Euro I).
EU28 land-based vs. shipping around Europe 2010-2030 (kton)

SO₂

NOₓ